

Report Documentation Page				Form Approved OMB No. 0704-0188	
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1. REPORT DATE <b>10 AUG 2010</b>		2. REPORT TYPE <b>Final</b>		3. DATES COVERED <b>09-02-2009 to 08-03-2010</b>	
4. TITLE AND SUBTITLE <b>Development of a Charged-Particle Accumulator Using an RF Confinement Method VI</b>				5a. CONTRACT NUMBER <b>FA23860914065</b>	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S) <b>Ryugo Hayano</b>				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) <b>University of Tokyo,7-3-1 Hongo, Bunkyo-ku,Tokyo, Japan,JP,113-0033</b>				8. PERFORMING ORGANIZATION REPORT NUMBER <b>N/A</b>	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) <b>Asian Office of Aerospace Research &amp; Development, (AOARD), Unit 45002, APO, AP, 96338-5002</b>				10. SPONSOR/MONITOR'S ACRONYM(S) <b>AOARD</b>	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S) <b>AOARD-094065</b>	
12. DISTRIBUTION/AVAILABILITY STATEMENT <b>Approved for public release; distribution unlimited</b>					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT <b>This is the final report of a project to construct a trap to accumulate a large number of positrons.</b>					
15. SUBJECT TERMS <b>Particle Physics, Positrons, Paul Traps</b>					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT <b>Same as Report (SAR)</b>	18. NUMBER OF PAGES <b>1</b>	19a. NAME OF RESPONSIBLE PERSON
a. REPORT <b>unclassified</b>	b. ABSTRACT <b>unclassified</b>	c. THIS PAGE <b>unclassified</b>			

Final Report for AOARD Grant FA2386-09-1-4065 “**Development of a Charged-Particle Accumulator Using an RF Confinement Method VI**”

**10 August 2010**

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Period of Performance: 2/9/2009 – 3/8/2010

This project was recognized at CERN as one of the important R&D projects, in which traps were to be constructed for storing large quantities of positrons.

We completed the final design of the Paul-trap electrodes, and based on the test-cavity results, we produced of the final version of the electrodes. Raw materials were obtained, and machining was done at CERN.

We also completed the cool-down test of the cryostat. This was a time consuming process, because every time a vacuum leak was found, the faulty part had to be sent back to the central workshop for repair. Due to the mechanical and cryogenic complexity of the device, several iterations of the cool-down test were necessary.

Once the cool-down test was completed, we installed the Paul-trap cavity in the cryostat, and connected it to an RF source. We first measured the quality factor (Q) under low-power conditions, and then we tested the voltage-standing capability of the cavity under full power.

Upon completion of the cryostat test and the cavity test, we then used an electron gun to ionize hydrogen (residual gas in the trap was sufficient), trapped the liberated protons, “opened” the trap (by lowering the voltage applied to the end cap electrode of the trap), and counted the number of trapped protons using a Faraday cup.

All these tests were successful. Our next step will be to attempt to trap positrons.